

Since 1898, USDA scientists have explored the far reaches of the world for valuable crop plants and natural enemies to control pests. These trips—dozens each year—are crucial. Some of our most important crop plants and successful biological control programs have resulted from such forays.

The hope of new scientific discovery and the allure of foreign lands can make exploration one of the most exciting and rewarding parts of a researcher's career. Still, it's no vacation. To meet their goals, scientists face illness, transportation rigors, cultural barriers, and even wild animals.

*Last fall, ARS entomologists Raymond I. Carruthers and Alan A. Kirk, ARS plant pathologist Timothy L. Widmer, and University of California ecologist Thomas L. Dudley spent 3 weeks in Nepal and India searching for biological control agents that could help U. S. land managers control some exotic pests here. These pests—giant reed (*Arundo donax*), saltcedar (*Tamarix*), and pink hibiscus mealybug—are believed to have originated on the Indian subcontinent, so the scientists expected to find natural enemies there.*

The journal below gives a brief glimpse of the challenges and successes of an exploration. Carruthers leads the ARS Exotic and Invasive Weeds Research Unit at the Western Regional Research Center in Albany, California. Kirk and Widmer work at the ARS European Biological Control Laboratory in Montpellier, France. Dudley works for the University of California, Berkeley. Unless indicated, Carruthers wrote the following entries about the Nepal portion of the trip.

PHOTOS PROVIDED BY RAY CARRUTHERS

Day 1

After days of getting everything in order in the lab, I'm off and away. As always, our original, well-organized itinerary was changed. This time it was an unexpected weeklong religious holiday in Nepal. Most of the roads would've been blocked with celebrations, and fuel would've been unavailable. We rescheduled our flights, plans, and meetings. Thanks to Charles Myers and Michele Williams of the ARS travel staff, my passport with visas showed up in time.



K9388-14

The hope of new scientific discovery and the allure of foreign lands.

Day 4

Once in Nepal, we discovered that the American Embassy was considering canceling our travel. Suspected terrorists were expected to cause significant problems. Also, a general strike planned for later in the week would halt all forms of transportation. We agreed to stay away from areas where the potential threats were most severe.

Packed into a 30-year-old Toyota Corolla, we headed south out of Kathmandu. We were like an ant among dinosaurs, weaving in and around bulging trucks, buses with people hanging out the doors, and potholes larger than our car.

Kirk: Three blowouts on the way. I understand why the front passenger seat is called the "suicide seat"! Those in the back seat explored levels of cramp unfathomable before this trip.

Carruthers: We headed off to the Royal Chitwan National Park to find *Arundo donax* in a natural setting. There we were free to explore, even though the rest of the country is on strike. Until now, we have only found *Arundo* in cultivated situations in Nepal. The locals chop it down and use it for fencing, roofing, insulation, and a million other things.

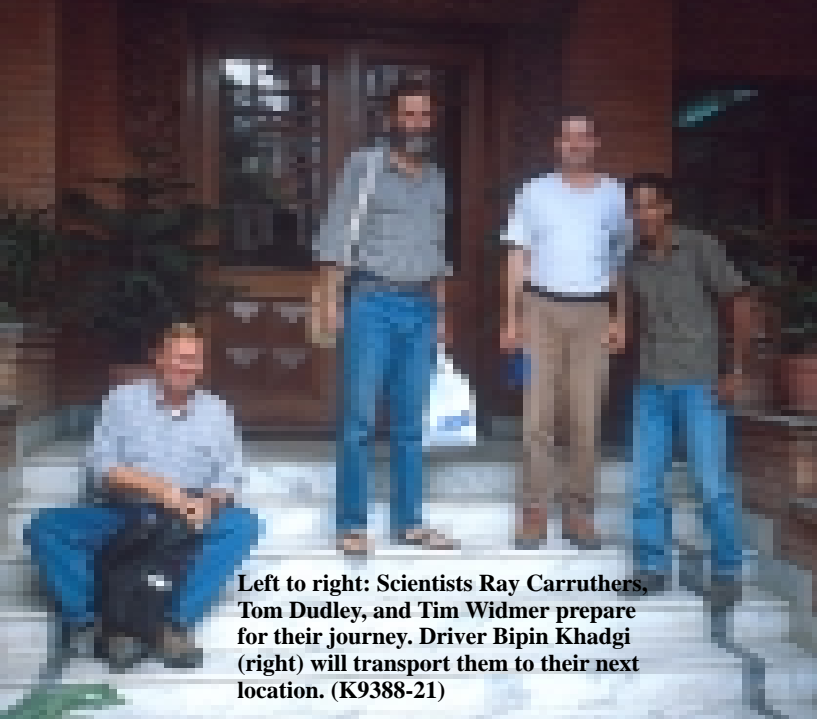
Most of the insects that we have found so far don't really seem to cause great damage. In the United States, hardly anything feeds on *Arundo*—or is even found resting on it.

We made lots of plant collections for DNA analysis, pickled lots of bugs, and collected detailed GPS [global positioning system] readings to mark our locations.

Day 5

Today was quite a day! Up before dawn and along the river's edge by daybreak. We (and our guides) entered a rather rustic-looking dugout canoe. The canoe was first poled upstream and then, once well above our anticipated landing site, was cut rapidly into the current. It was slow-going upstream in the still water along the river's edge. But once we moved out into the mainstream, the action was fast-moving and wet.

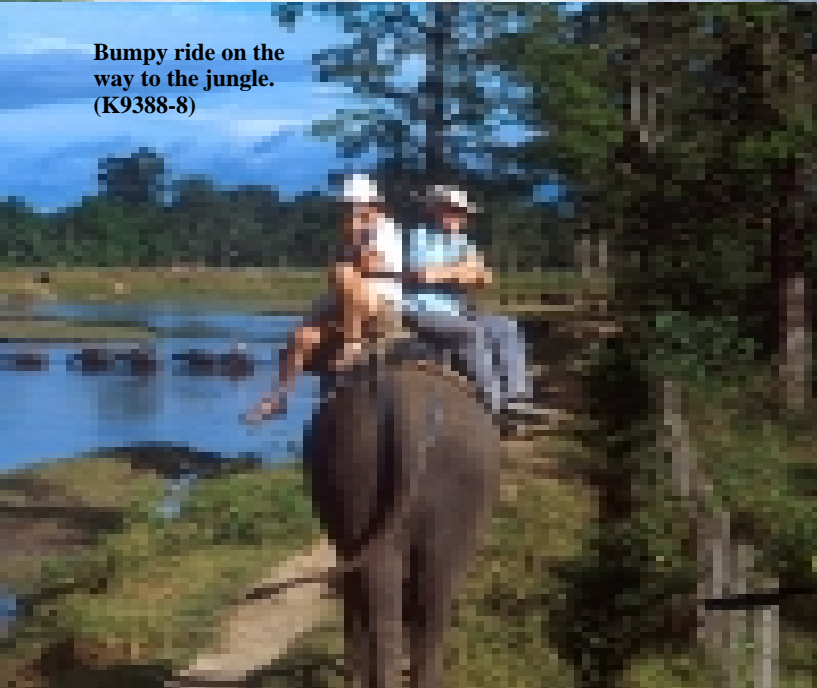
After the crossing, we headed into the heavily treed jungle. We were struck by the quantity and size of the insect fauna. As we pushed our way through the overgrown path into the jungle, we found exotic-looking insects everywhere. There were hundreds of large, bright-red-and-black seed bugs crawling all over the forest floor. A team of entomologists and ecologists could not have been closer to heaven. We were not at all worried about the bugs. It was the rhinos and tigers—the prized wildlife of this park—that we were keeping an eye out for.



Left to right: Scientists Ray Carruthers, Tom Dudley, and Tim Widmer prepare for their journey. Driver Bipin Khadgi (right) will transport them to their next location. (K9388-21)



Traffic jam en route to Kathmandu. (K9388-11)



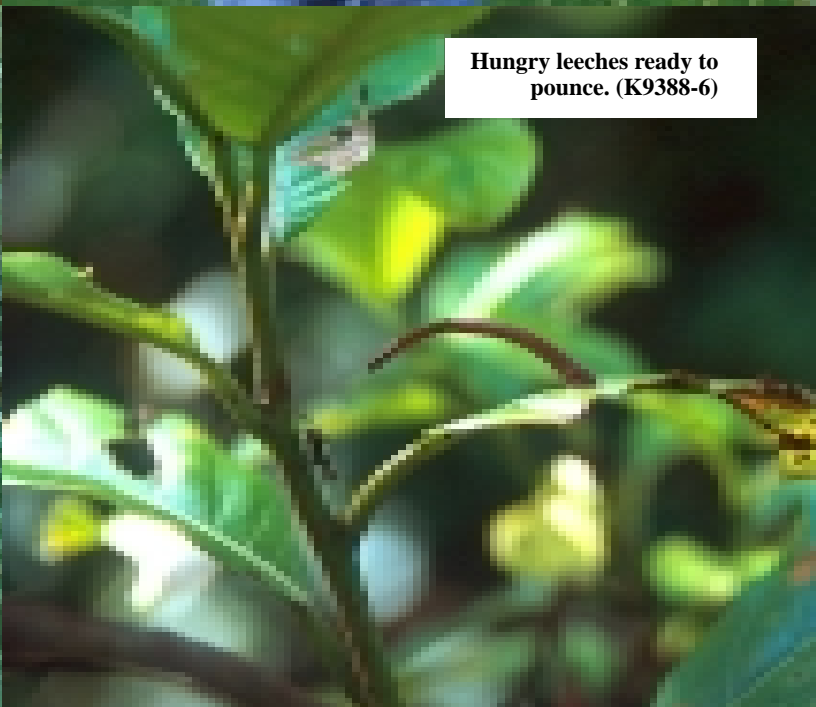
Bumpy ride on the way to the jungle. (K9388-8)



Using an aspirator to collect leaf-feeding insects on giant reed, *Arundo donax*. (K9388-1)



Male rhino protecting a calf. (K9388-9)



Hungry leeches ready to pounce. (K9388-6)



Dieback of giant reed from caterpillars that bore into the stem. (K9388-16)



Alan Kirk (center) collects insect specimens with other scientists by cutting open stems in tall elephant grass. (K9388-2)



Ewww! Leeches leave their mark. (K9388-7)

Trouble actually came in a totally different form. Looking down—rather than out ahead of us—we realized that our bodies were covered with leeches. Disgusting!!! As much as the bugs were great, the leeches were unwelcome. Blood splotches began appearing through our pants and socks.

Luckily, we didn't encounter any rhinos or tigers in the area that we explored by foot. We did find *Arundo* and some close relatives and made some excellent collections of plant material for genetic analysis and of insects feeding on different parts of the plants. But we didn't find as much as we had hoped for. We saw no insect natural enemy with the potential to devastate this plant.

After a lunch of fried rice with eggs and peppers, we struck out to meet our elephant transport to another area of the jungle. This trip would be farther than we could easily walk, and we certainly expected to encounter rhinos on this segment of the trip. Being on elephant back would be a definite advantage.

The ride was excruciatingly painful. I think the elephant that Tim and I shared had one leg about a foot shorter than its others. The platform on which we and our gear were perched rocked and rolled like a rowboat in 10-foot waves. But at least we were above the leeches!

As we progressed through the jungle and grassland areas, we came across lots of different *Arundo*-like grasses and some *Arundo* itself. We collected as before, but we were still lacking significant natural enemies.

We did find rhinos. First, two large females taking a dip in a mud-filled pond. Next, a large male rhino accompanying a young calf. It was obvious that we needed to put some ground between ourselves and this fellow, so we didn't hang around too long.

Day 6

Based on our trip and on information from cooperators at Rampur University, we headed back to Kathmandu. Dr. Dhurma Raj Dangol agreed to help us on our project in the future and said he could arrange to survey the plants and insects of interest during the year. This was just the type of assistance that we were looking for.

Day 7

We searched the southwest side of Kathmandu for more natural enemies of all of our target plants. Here we found *Arundo* attacked by armyworm-like caterpillars. These larvae were eating the plant leaves, causing significant defoliation. At first we were in hot water, since we found the damaged *Arundo* growing along the border of a local woman's garden. She clearly did not want weird foreigners around. But when we showed her the kira (insects), she was very interested. Then, through sign language we discussed many of the other insects that were problems in her garden. Eventually, we found Bipin (our driver),

and we were able to help her determine which insects were pests and which she should not be concerned about. We made such good friends, she would hardly let us leave.

Day 8

Today we hit “*Arundo* gold” near the southeast corner of the Kathmandu Valley. We were stopping for gas beyond the edge of town and spotted some *Arundo* growing on a knoll behind the filling station. Knives in hand, we trudged back through some cesspools and started splitting *Arundo* stalks. We found a number of deformed plants with tip dieback. Lo and behold, they were infested with large, stem-boring caterpillar larvae. Random checks around the area showed many previously damaged stalks that were now dead. Many still had live larvae feeding away. After an hour of collecting, we had acquired quite a number of these insects and photographed their impact on the *Arundo* plants. We described the collection site in fine detail, GPS’ed the location so that we could easily relocate it, and then packed the specimens for their return trip to USDA’s quarantine facility in Montpellier.

Day 10

The terrorists did indeed make a move—but not towards us. The *Kathmandu Post* cited 14 killed, 40 injured, lots of money stolen, 19 inmates freed, and many hostages taken during the night. Sounds like a good day to leave the country.

Actually, Nepal has been an excellent host country for us. Many of the locals volunteered to join in our insect hunts and always seemed to know just the right spot to find the *Arundo* plants shown in our photos. Some of the local children absolutely loved the idea of finding bugs and learning more about their native environment. I wouldn’t be surprised if some of them become famous entomologists someday.

Dhanyabad. “Thanks,” as they say it here!

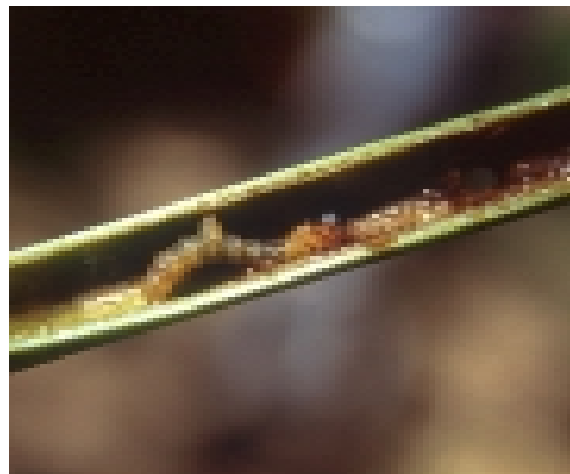
The fruits of such an exploration may not be known for months. But even a few potential biological control agents make the effort worthwhile. In Nepal and India, the team collected 14 insect and pathogen species to evaluate against 5 plant and insect pests. They’ll study them in quarantine to determine their efficacy and safety. Friends and research partners they made while traveling will help ARS continue the projects there for years to come.—By **Kathryn Barry Stelljes**, ARS.

This research is part of Crop Protection and Quarantine, an ARS National Program (#304) described on the World Wide Web at <http://www.nps.ars.usda.gov>.

To reach scientists mentioned in this story, contact Raymond I. Carruthers, USDA-ARS Exotic and Invasive Weeds Research Unit, 800 Buchanan St., Albany, CA 94707; phone (510) 559-6127, fax (510) 559-6123, e-mail ric@pw.usda.gov.



Caterpillar tunneling through giant reed, *Arundo donax*. (K9388-18)



Unidentified stem-boring beetle larvae in giant reed. (K9388-10)



Future entomologists in Nepal? (K9388-19)